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WILDFIRES AND THUNDERSTORMS ON ALASKA'S NORTH SLOPES

by

RICHARD J. BARNEY AND ALBERT L. COMISKEY[1/]

ABSTRACT

Existing records show that five wildfires burned more than 1,600 hectares of tundra on Alaska's Arctic Slope. Environmental conditions suitable for lightning, ignition, and burning occur more often than previously recognized at this northern latitude.

Keywords: Wildfires, Alaska, tundra, thunderstorms, lightning.

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[1/] Richard J. Barney is now with Northern Forest Fire Laboratory, Intermountain Forest and Range Experiment Station, Missoula, Montana. Albert L. Comiskey is with National Weather Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, Anchorage, Alaska.

FOREST SERVICE - U.S. DEPARTMENT OF AGRICULTURE - PORTLAND, OREGON

Until now, wildfires (free-burning fires occurring on wild lands) on the North Slope tundra of Alaska have been considered almost non-existent. A statistical summary by Hardy and Franks (1963) did not mention any wildfire activity north of the Brooks Range. The same absence of far northern wildfire acknowledgment is evident in other publications (Spetzman 1959; Barney 1969a, 1971). No wildfire activity was reported as occurring at the northern latitudes on Alaska's North Slope. Personal communications with several individuals have pointed out that fires have occurred north of the Brooks Range divide in the past. Spetzman indicated several man-caused fires have burned in the drier tundra sites in years gone by. Others have observed towering cumulus clouds (probably thunderstorms) in the vicinity of the North Slope. Until recently, official records of the Bureau of Land Management, U.S. Department of the Interior, did not indicate fires occurred at such northern locations. This Federal agency has been responsible for fire suppression activities in the area since the early 1940's.

This lack of official Bureau of Land Management information was found to be partly due to their method of data handling. Wildfires occurring at the extreme northern latitudes had apparently heretofore been pooled with data from other administrative management units at lower latitudes, thereby losing specific identity in terms of their location north of the Brooks Range. In reviewing the Bureau of Land Management's official fire reports, five fires were identified as occurring north of the Brooks Range, on Alaska's North Slope.

Figure 1 shows the general fire locations. Table 1 provides more detailed information on the location, date, size, and cause of the fires. It should be noted that none of these fires has been verified on the ground by the authors. However, one of the fires noted in table 1 is one on which fire suppression action was taken. Suppression action was not taken on the others, either because of higher priority fires elsewhere or because the fire was dead when discovered.

Wildfire activity in northern latitude tundra has been documented in both Canada and Russia. Lightning fires have been reported in the Yukon Territory of Canada as far north as approximately 67°20'N. latitude (Requa 1964). In their paper on fire in the Canadian Northwest Territories, Cochrane and Rowe (1969) reported considerable fire activity was apparent in the arctic tundra: "The environment of the Eastern Arctic 'barrens' is one where the complete absence of fire might be expected. The terrain is that of a vast low plain, windswept and treeless.... Nevertheless, fires do occur, contributing to the

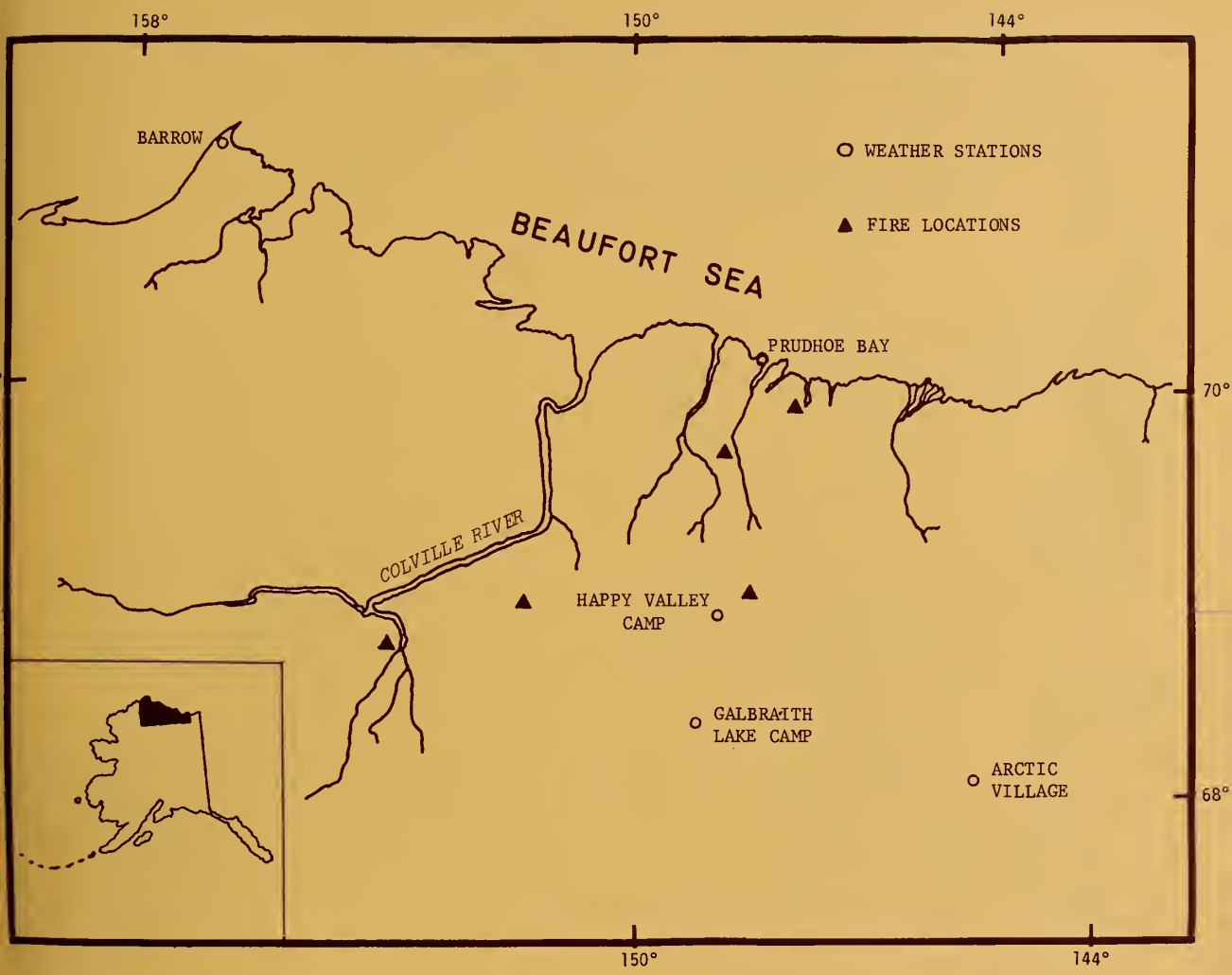

Figure 1.--*Map showing general locations of fires north of the Brooks Range.*

complexity of the tundra ecology." They go on to state that burning is selective and that Labrador tea and ground birch are quite flammable. Wildfires have also been reported in the Minor River and Kugaluk River regions of the Canadian Northwest Territories (Cody 1964). One of these fires was estimated to be 2,124 square kilometers in size. Some of these fires have burned well above the 69°N. latitude line. A forest fire at Inuvic, N.W.T., Canada, burned more than 34,800 hectares (Heginbottom 1971). The Russians have also reported wildfire activity in the Siberian tundra at approximately 70°N. latitude (Kriuchkov 1968). In this paper Kriuchkov discusses pyrogenic tundra. All the above references indicate that tundra can and does burn at far northern latitudes.

Table 1.--*Fires reported north of the Brooks Range, 1969-71.*

Characteristic	Bureau of Land Management fire number				
	9485	9557	9893	8813[1/]	8826
Date of fire discovery[2/]	6/21/69	7/7/69	8/5/70	7/7/71	7/9/71
Reported size (approximate) (hectares)	1,619.4	2.0	28.3	3.6	2.0
Reported cause	Lightning	Lightning	Man	Lightning	Lightning
Latitude	68°49'	70°05'	69°40'	69°02'	69°04'
Longitude	153°33'	147°50'	148°59'	151°55'	148°41'
Approximate elevation (meters)	335	24	122	137	396
Location	W. side Killik River	E. side Sagavanirktok River	E. side Toolik River	E. side Chandler River	N. side Lupine River
Physiographic province	Foothills	Coastal plain	Coastal plain	Foothills	Foothills
Vegetation[3/]	Well-drained tundra ridges	Wet coastal plain tundra	Wet coastal plain tundra	Moraine hills, dry tundra	Moraine hills, dry tundra

[1/] Control action was taken on this fire by 6 men.

[2/] This is the date of discovery and does not necessarily agree with the actual start date.

[3/] Based on map and classifications by Spetzman (1963).

Although wildfires may not be ecologically significant north of the Brooks Range divide, it is certainly important to note that wildfire activity can and does occur there. We suspect that fires have not been reported prior to this time because of poor detection at such northerly latitudes. However, with the increased activity on the North Slope relative to oil exploration and development, more and more fires apparently are being reported. It also seems reasonable that along with the increased activity in the area, man will become a more important cause of fire.

Based on the Alaskan climatological data, there are apparently over 30 days every year on which wildfires can occur at these extreme northern latitudes. Temperatures during June and July reach a high near 20°C. at Arctic Village, Galbraith Lake Camp, and Happy Valley Camp. Temperatures reaching the lower 20's°C. are not uncommon

at these locations (U.S. Department of Commerce 1971). High temperatures near 30°C. have been reported in the foothill areas of the North Slope in mid-July (Spetzman 1959). Even Barrow temperatures reach near 21°C. on occasion, and 10°-15°C. maximums are not uncommon there during June and July. A maximum temperature of 23.9°C. has been reported at Prudhoe Bay (Weller and Brown 1971).

With the light, finely divided fuels present in the tundra, it is highly probable that conditions suitable for ignition occur more often than have been previously reported. The abundant low shrubs, grasses, sedges, lichens, and mosses provide ample organic material to sustain combustion. When finely divided dead plant material (0.6-cm diameter and less) is subjected to temperatures in the lower 20's°C. and relative humidities below 70 percent, we calculate that fine-fuel moisture will be about 10 percent and less on an ovendry weight basis (Barney 1969b). Temperature and fuel moisture conditions of this nature are necessary basic ingredients for ignition. When continuous fuels are present and an ignition source is available, fire is certainly possible under such environmental situations.

One ignition source is lightning. During the last 10 or 20 years, there have been random reports of thunderstorms from pilots flying to and from the arctic coast. Since wildfires occurring at lower latitudes are known to have been started by lightning, it seems reasonable that a similar situation undoubtedly occurs at the northern latitudes also.

Because there are few observing stations, climatology of thunderstorm occurrences over the Arctic Slope is nonexistent. However, a significant accumulation of thunderstorm data was obtained during the summer of 1971. During that time, the Bureau of Land Management made numerous thunderstorm patrols in a high-flying aircraft. The plane usually flew at the 12,500-meter level, from which it was possible to see horizontally to a distance of about 320 kilometers. Patrol routes were always restricted to the area between the Brooks Range and the Gulf of Alaska, but it was usually possible to see a portion of the Arctic Slope from the aircraft when it was patrolling the south slopes of the Brooks Range. In this way, numerous sightings were made of huge cumulonimbus clouds (probably thunderstorms) over the Brooks Range and the Arctic Slope.

A record was kept of all probable thunderstorms observed. The first was estimated to be about 80 kilometers east of Sagwon on June 17. On June 18, a line of probable thunderstorms was observed over the highest portion of the Brooks Range from the Canadian border west for a distance of 480 kilometers. On June 22 a line of thunderstorms 640 kilometers long was again observed over the Brooks Range. On June 26 a line of storms about 480 kilometers long was observed over the western portion of the Brooks Range. On the following day, June 27, the line was about 320 kilometers long, and numerous fires were reported in the Noatak River valley. The Noatak River runs generally east to west, empties into Kotzebue Sound, and bisects the western portion of the Brooks Range. On July 20, 24, and 26 the patrol observed thunderstorms over and north of the Brooks Range. It is estimated that during this period a total of 28 probable thunderstorms were observed over or north of the Brooks Range.

Many of the sightings were from a considerable distance, which tends to negate their validity--particularly with respect to location. Thus, many of the storms that were estimated to be over the Brooks Range could well have been over the Arctic Slope. It is reasonably certain that they were not south of the range. It is the opinion of the observers that if the patrol had flown over the Arctic Slope, more thunderstorms would have been sighted, and of course their locations would have been estimated much more precisely.

The summer of 1971 was not a particularly active thunderstorm year for the area between the Brooks Range and the Gulf of Alaska, although the occurrence pattern was unusual. There was almost no thunderstorm activity until about June 20. From June 20 to July 9 there was extensive and vicious thunderstorm activity during which many fires began south of the Brooks Range. Thunderstorm tops measured to an unusually high 12,500 meters. After July 9, there was only random thunderstorm activity.

It is the opinion of the authors that burnable fuel conditions and thunderstorms will occasionally coincide, thereby creating widely spaced potential wildfire conditions over the Arctic Slope. Man and his activities are another potential ignition source. As his access into the area improves, the probability that he will start fires increases.

Although there has been limited formal record of fire previous to this time, we think it is safe to assume that lightning and the associated weather and fuel conditions suitable for fire have been present for many years. It also seems reasonable to assume that

fires have not just recently begun occurring north of the Brooks Range. With continued activity in that location, we are certain to receive more and more wildfire reports. Although the North Slope is apparently not a fire-dominated ecosystem, wildfire is not unknown to this arctic environment.

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